

16 GLASS	Page 1 of 13
Division of Forensic Science TRACE EVIDENCE TRAINING MANUAL	Amendment Designator:
	Effective Date: 29-March-2004
<p style="text-align: center;">16 GLASS</p> <p>16.1 Introduction to Glass</p> <p>16.1.1 Objectives</p> <p>Through completion of this module the trainee will develop the theoretical knowledge to be conversant in:</p> <ul style="list-style-type: none"> • The history of glass; • Manufacturing processes and applications of glasses; • The chemical composition, to include formulations, of glass; and, • The general aspects of forensic glass examinations. <p>16.1.2 Required Readings</p> <p>16.1.2.1 Almirall, J., et. al., “Examination of Glass”, <u>Forensic Interpretation of Glass Evidence</u>, Curran, J., et. al. ed., CRC Press, New York, 2000, pp. 1-6.</p> <p>16.1.2.2 Copley, Geoffrey J., “The composition and manufacture of glass and its domestic and industrial applications”, <u>Forensic Examination of Glass and Paint: Analysis and Interpretation</u>, Caddy, Brian, ed., Taylor & Francis, New York, NY, 2001, pp. 27-46.</p> <p>16.1.2.3 Miller, Elmer T., “Forensic Glass Comparisons”, <u>Forensic Science Handbook</u>, Saferstein, R., ed., Prentice-Hall, NJ, 1982, pp. 139-146 and 168-180.</p> <p>16.1.2.4 Saferstein, R., “Physical Properties: Glass and Soil”, <u>Criminalistics: An Introduction to Forensic Science</u>, Prentice Hall, New Jersey, 5th edition, 1995, pp. 101-103.</p> <p>16.1.2.5 Thornton, J. I., “Interpretation of Physical Aspects of Glass Evidence”, <u>Forensic Examination of Glass and Paint: Analysis and Interpretation</u>, Caddy, Brian, ed., Taylor & Francis, New York, NY, 2001, pp. 97-121.</p> <p>16.1.3 Questions</p> <p>The trainee will provide written answers to the following questions:</p> <ul style="list-style-type: none"> • Define glass. • Why is glass useful forensic evidence? • Give a brief summary of the history of glass, from its “invention” to its present day use. • What is the purpose of Si, Na and Ca in glass in ordinary soda lime glass? • What elements can be used to provide glass with improved resistance to thermal expansion, alkali and acid? • What are some of the colorants and discolorants used in the formulation of glass? • Explain formers, modifiers and intermediates. • Define cullet. • Explain the basic manufacturing process for container glass, float glass, tempered glass and laminated glass. • Describe the benefits of tempering. • Describe annealing and explain its production process. • What are the manufacture end uses for tempered, laminated, wire reinforced and low-e glass? <p>16.1.4 Evaluation</p> <p>16.1.4.1 The trainer will review the written answers to the questions with the trainee.</p>	

16 GLASS	Page 2 of 13
<div>Division of Forensic Science</div> <div>TRACE EVIDENCE TRAINING MANUAL</div>	Amendment Designator:
	Effective Date: 29-March-2004
<p>16.1.4.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.</p> <p>16.1.4.3 The trainee will be quizzed orally upon the subject matter.</p> <p>16.2 Recognition, Collection, Packaging and Controls</p> <p>16.2.1 Objectives</p> <p>Through completion of this module the trainee will have developed and demonstrated theoretical knowledge and/or practical skills relating to:</p> <ul style="list-style-type: none"> • Recognize and preserve other evidentiary materials; • Describe the proper collection of glass evidence; and, • Make recommendations for proper packaging of glass evidence. <p>16.2.2 Required Readings</p> <p>16.2.2.1 Trace Evidence Handbook, Internal Publication, pp. 3-8, 66-80.</p> <p>16.2.2.2 Virginia Division of Forensic Science Evidence Handling Guide:</p> <ul style="list-style-type: none"> • Examples of Trace Evidence Submissions • Trace Evidence Section <p>16.2.2.3 Saferstein, R., "Physical Properties: Glass and Soil", <u>Criminalistics: An Introduction to Forensic Science</u>, Prentice Hall, New Jersey, 5th edition, 1995, pp. 111-112.</p> <p>16.2.3 Questions</p> <p>The trainee will provide written answers to the following questions:</p> <ul style="list-style-type: none"> • Describe how evidence should be collected and packaged for each of the following scenarios as it would be described to an investigator who has made an inquiry: <ul style="list-style-type: none"> ○ Two suspects, 3 separate businesses ○ One suspect, a single residence B & E, multiple windows broken • Why should clothing for glass examination and the known glass sample never be packaged in the same container? • Why should a sample of glass be collected from every broken window at the scene? • Why should glass evidence be collected from the frame or frames rather than the ground/floor/windowsill? • Explain the types of packaging used with glass evidence. Include advantages and disadvantages of these types of packaging. <p>16.2.4 Practical Exercise</p> <p>16.2.4.1 Demonstrate an evidence fold to the trainer.</p> <p>16.2.5 Evaluation</p> <p>16.2.5.1 The trainer will review the written answers to the questions with the trainee.</p> <p>16.2.5.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.</p> <p>16.2.5.3 Review of practical exercise.</p>	

16 GLASS	Page 3 of 13
Division of Forensic Science TRACE EVIDENCE TRAINING MANUAL	Amendment Designator:
	Effective Date: 29-March-2004
<p>16.3 Physical Properties of Glass</p> <p>16.3.1 Objectives</p> <p>Through completion of this module the trainee will have developed and demonstrated theoretical knowledge and/or practical skills to:</p> <ul style="list-style-type: none"> • Determine the physical properties of glass to include: color, texture, thickness, temper, float, flat, container, type, and other surface characteristics; • Demonstrate the use of a micrometer; • Demonstrate the use of a continuity tester to determine if a glass sample has a low-e surface coating; and, • Perform a sink/float density comparison. <p>16.3.2 Required Reading</p> <p>16.3.2.1 Almirall, J., et. al., "Examination of Glass", <u>Forensic Interpretation of Glass Evidence</u>, Curran, J., et. al. ed., CRC Press, New York, 2000, pp. 2-5 and 10-14.</p> <p>16.3.2.2 Miller, Elmer T., "Forensic Glass Comparisons", <u>Forensic Science Handbook</u>, Saferstein, R., ed., Prentice-Hall, NJ, 1982, pp. 162-164.</p> <p>16.3.2.3 Saferstein, R., "Physical Properties: Glass and Soil", <u>Criminalistics: An Introduction to Forensic Science</u>, Prentice Hall, New Jersey, 5th edition, 1995, pp. 103-104.</p> <p>16.3.3 Questions</p> <p>The trainee will provide written answers to the following questions:</p> <ul style="list-style-type: none"> • How is a glass sample determined to be a float or non-float type? • How is a broken tempered glass source identified? • Describe the types of density determination/comparison processes. Which process is used by the Virginia Division of Forensic Science Trace Evidence Section? • What are some identifiable characteristics of container glass, including surface and physical characteristics that can be determined visually and microscopically? • How is low-e glass identified? • How is laminated glass identified? • Describe the distinguishing characteristics (including physical properties) that can be determined for mineral wool samples. • What physical properties are normally measured or noted in glass analysis? <p>16.3.4 Practical Exercises</p> <p>16.3.4.1 The trainer will discuss with the trainee how to take appropriate notes, how to properly use worksheets and what abbreviations are in standard use for paint analysis.</p> <p>16.3.4.2 The trainer will demonstrate how each physical property is determined for glass samples.</p> <p>16.3.4.3 The trainer will provide ten different glass samples for the trainee to determine physical properties. The trainee will fill out a glass worksheet for each glass sample detailing the observations made.</p>	

16 GLASS	Page 4 of 13
Division of Forensic Science TRACE EVIDENCE TRAINING MANUAL	Amendment Designator:
	Effective Date: 29-March-2004
<p>16.3.4.4 The trainer will provide a set of glass samples that consists of a number of different types of glass. The trainee will determine physical properties for each sample detailing the observations made. The set of glass samples will include as a minimum: container glass; light bulbs; headlamps; and flat glass sources of tempered, non-tempered, float, non-float, wire-reinforced, laminated, and low-e types.</p> <p>16.3.4.5 The trainer will provide a number of different types of glass to compare using the sink/float density comparison method, to include glasses of known refractive index that have similar and differing refractive indices.</p> <p>16.3.5 Evaluation</p> <p>16.3.5.1 The trainer will review the written answers to the questions with the trainee.</p> <p>16.3.5.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.</p> <p>16.3.5.3 Review of practical exercises.</p> <p>16.4 Basic Microscopic Evaluation of Glass and Other Materials</p> <p>16.4.1 Objectives</p> <p>Through completion of this module the trainee will have developed and demonstrated theoretical knowledge and/or practical skills to:</p> <ul style="list-style-type: none"> • Discuss microscopy theory and applications; • Properly use a stereomicroscope and polarized light microscope; • Make microscopic observations of glass, sand and other materials; • Determine if a material is isotropic or anisotropic; • Identify microscopic particles as glass; and, • Perform refractive index estimations using the Becke line technique. <p>16.4.2 Required Readings</p> <p>16.4.2.1 Almirall, J., et. al., "Examination of Glass", <u>Forensic Interpretation of Glass Evidence</u>, Curran, J., et. al. ed., CRC Press, New York, 2000, pp. 2-5 and 10-14.</p> <p>16.4.2.2 De Forest, P. R., "Foundation of Forensic Microscopy", <u>Forensic Science Handbook</u>, Saferstein, R., ed., Prentice-Hall, NJ, 1982, pp. 415-483, 486-487 and 504-512.</p> <p>16.4.2.3 Hamer, P. S., "Microscopic Techniques for Glass Examination", <u>Forensic Examination of Glass and Paint: Analysis and Interpretation</u>, Caddy, Brian, ed., Taylor & Francis, New York, NY, 2001, pp. 47-55.</p> <p>16.4.2.4 Miller, Elmer T., "Forensic Glass Comparisons", <u>Forensic Science Handbook</u>, Saferstein, R., ed., Prentice-Hall, NJ, 1982, pp. 154-159.</p> <p>16.4.2.5 Saferstein, R., "The Microscope", <u>Criminalistics: An Introduction to Forensic Science</u>, Prentice Hall, New Jersey, 5th edition, 1995, pp. 173-185.</p> <p>16.4.2.6 Saferstein, R., "Physical Properties: Glass and Soil", <u>Criminalistics: An Introduction to Forensic Science</u>, Prentice Hall, New Jersey, 5th edition, 1995, pp. 104-108.</p> <p>16.4.3 Questions</p> <p>The trainee will provide written answers to the following questions:</p>	

16 GLASS	Page 5 of 13
<div>Division of Forensic Science</div> <div>TRACE EVIDENCE TRAINING MANUAL</div>	Amendment Designator:
	Effective Date: 29-March-2004
<div> <ul style="list-style-type: none"> • Prepare a brief technical explanation of the following types of microscopes: <ul style="list-style-type: none"> ○ Compound microscope ○ Stereo microscope ○ Phase contrast microscope ○ Polarized light microscope (PLM) • What characteristics can be observed from the microscopic examination of a glass particle? • Define and explain the terms isotropic, anisotropic and birefringence. • What information can be determined from the observed degree of contrast between a particle and the oil medium? • What information can be determined using the Becke Line technique? • Describe the procedure for adjusting a microscope to Kohler Illumination. </div> <div>16.4.4 Practical Exercises</div> <div> <div>16.4.4.1 The trainee will conduct stereoscopic examinations of glass, sand and other common materials. Record observations to include: color, clarity and shape.</div> <div>16.4.4.2 The trainee will conduct PLM examinations of glass, sand and other common materials in oil mounts. Record if the materials are isotropic or anisotropic and note the Becke line movement.</div> <div>16.4.4.3 The trainee will observe glass samples mounted in Cargille oils with refractive indices below, near and above that of the glass sample. Record the isotropic property, degree of contrast (relief) and refractive index relative to the mounting oil.</div> <div>16.4.4.4 The trainee will be given a set of unknown glass samples. Estimate the refractive index of each sample by Becke line technique using Cargille oils.</div> </div> <div>16.4.5 Evaluation</div> <div> <div>16.4.5.1 The trainer will review the written answers to the questions with the trainee.</div> <div>16.4.5.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.</div> <div>16.4.5.3 Review of practical exercises.</div> </div> <div>16.5 Introduction to GRIM2 Theory and Application</div> <div>16.5.1 Objectives</div> <div> <div>Through completion of this module the trainee will have developed and demonstrated theoretical knowledge and/or practical skills to:</div> <ul style="list-style-type: none"> • Perform the calibration of the system; • Perform QC checks and assess proper operation of system; • Understand the components of system; and, • Perform routine troubleshooting and maintenance. </div> <div>16.5.2 Required Readings</div> <div>16.5.2.1 GRIM2 Installation and Instruction Manual.</div>	

16 GLASS	Page 6 of 13
<div>Division of Forensic Science</div> <div>TRACE EVIDENCE TRAINING MANUAL</div>	Amendment Designator:
	Effective Date: 29-March-2004
<p>16.5.2.2 Manual for Locke Scientific Reference Glasses and Silicone Oils for Refractive Index Determination (Parts 1 through 7).</p> <p>16.5.2.3 Hamer, P. S., "Microscopic Techniques for Glass Examination", <u>Forensic Examination of Glass and Paint: Analysis and Interpretation</u>, Caddy, Brian, ed., Taylor & Francis, New York, NY, 2001, pp. 56-62.</p> <p>16.5.3 Questions</p> <p>The trainee will provide written answers to the following questions:</p> <ul style="list-style-type: none"> • What are the main components of the GRIM2 system? • What wavelength is used for routine refractive index measurements? • How is the wavelength changed on the GRIM2? • What data is actually measured by the GRIM2 to determine refractive index? • Explain the QC checks on the GRIM2 system? <p>16.5.4 Practical Exercises</p> <p>16.5.4.1 The trainer will demonstrate the operation of the GRIM2 system.</p> <p>16.5.4.2 The trainee will at a minimum perform a complete calibration of the system for Silicone Oil B using the B series of standards. Additionally, the trainee may perform the calibration for Silicone Oil A using Standards A2 through A5 and Standards B1 and B2.</p> <p>16.5.4.3 The trainee will measure a minimum of five of the B series standards as samples using the calibration generated in 16.5.4.2. Assess the measured values against the certified values for the standards.</p> <p>16.5.4.4 The trainer will demonstrate how the hot stage and slide are cleaned. The trainer will also demonstrate how the interference filter on the microscope is cleaned, and how the microscope lamp is changed.</p> <p>16.5.5 Evaluation</p> <p>16.5.5.1 The trainer will review the written answers to the questions with the trainee.</p> <p>16.5.5.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.</p> <p>16.5.5.3 Review of practical exercises.</p> <p>16.6 Refractive Index Measurement</p> <p>16.6.1 Objectives</p> <p>Through completion of this module the trainee will have developed and demonstrated theoretical knowledge and/or practical skills to:</p> <ul style="list-style-type: none"> • Assess a glass sample to determine the appropriate sampling technique and oil selection for refractive index measurement; • Measure the refractive index of glass samples using the GRIM2 system; and, • Determine if the refractive index of questioned glass particles and/or samples is consistent with the refractive index of a known glass sample. <p>16.6.2 Required Readings</p>	

16 GLASS	Page 7 of 13
Division of Forensic Science TRACE EVIDENCE TRAINING MANUAL	Amendment Designator:
	Effective Date: 29-March-2004
<p>16.6.2.1 Almirall, J., et. al., "Examination of Glass", <u>Forensic Interpretation of Glass Evidence</u>, Curran, J. M., et. al., ed., CRC Press, Washington, D.C., 2000, pp. 17-22 and 26.</p> <p>16.6.2.2 Hamer, P. S., "Microscopic Techniques for Glass Examination", <u>Forensic Examination of Glass and Paint: Analysis and Interpretation</u>, Caddy, Brian, ed., Taylor & Francis, New York, NY, 2001, pp. 56-62.</p> <p>16.6.2.3 Miller, Elmer T., "Forensic Glass Comparisons", <u>Forensic Science Handbook</u>, Saferstein, R., ed., Prentice-Hall, NJ, 1982, pp. 154-162.</p> <p>16.6.2.4 Saferstein, R., "Physical Properties: Glass and Soil", <u>Criminalistics: An Introduction to Forensic Science</u>, Prentice Hall, New Jersey, 5th edition, 1995, pp. 98-101.</p> <p>16.6.3 Questions</p> <p>The trainee will provide written answers to the following questions:</p> <ul style="list-style-type: none"> • Define refractive index. • Why is the property of refractive index useful for forensic glass examinations? • What are the limitations of refractive index for forensic glass examinations? • Explain Snell's Law. • Explain dispersion. • Explain the relationship between refractive index and dispersion. • How does annealing affect refractive index? • What are N_C, N_D and N_F? • Describe the Emmon's Double Variation Method and GRIM2. Compare and contrast. • Why are silicone oils used versus other types of oil media for refractive index measurement? <p>16.6.4 Practical Exercises</p> <p>16.6.4.1 The trainee will measure the refractive index of the glass samples examined in 16.3.4.2 using the GRIM2.</p> <p>16.6.4.2 The trainer will provide the trainee with a set of ten glass samples to be treated as unknowns that are obtained from glass standards with certified refractive index data. The trainee will measure the refractive index of the glass samples using the GRIM2.</p> <p>16.6.4.3 The trainer will give the trainee ten sets of glass samples, each set to include a minimum of one "known" and one "questioned" glass sample. The trainee will examine the physical properties, refractive index and density to determine if the "known" and "questioned" samples can be associated. The testing conducted should be done to the extent necessary to draw a conclusion.</p> <p>16.6.4.4 The trainee will examine as a minimum three different mineral wool or fiberglass samples.</p> <p>16.6.5 Evaluation</p> <p>16.5.5.1 The trainer will review the written answers to the questions with the trainee.</p> <p>16.5.5.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.</p> <p>16.5.5.3 Review of practical exercises.</p>	
16.7 Glass Particle Recovery and Collection from Clothing, Tools and Other Objects	

16 GLASS	Page 8 of 13
Division of Forensic Science TRACE EVIDENCE TRAINING MANUAL	Amendment Designator:
	Effective Date: 29-March-2004
<p>16.7.1 Objectives</p> <p>Through completion of this module, the trainee will have developed and demonstrated theoretical knowledge and/or practical skills to:</p> <ul style="list-style-type: none"> • Work with extremely small samples; • Recognize and recover glass from debris that has been recovered from clothing, tools and other objects; • Clean recovered glass particles in preparation for refractive index measurement; • Prepare a mount and sketch of the recovered glass particles; and, • Discuss transfer and persistence of glass particles on clothing. <p>16.7.2 Required Readings</p> <p>16.7.2.1 Almirall, J., et. al., "Examination of Glass", <u>Forensic Interpretation of Glass Evidence</u>, Curran, J. M., et. al., ed., CRC Press, Washington, D.C., 2000, pp. 6-10 and 14-21.</p> <p>16.7.2.2 Curran, J. M., et. al., ed., "Glass Found at Random and Frequency of Glass", <u>Forensic Interpretation of Glass Evidence</u>, CRC Press, Washington, D.C., 2000, pp. 87-102.</p> <p>16.7.2.3 Curran, J. M., et. al., ed., "Transfer and Persistence Studies", <u>Forensic Interpretation of Glass Evidence</u>, CRC Press, Washington, D.C., 2000, pp. 103-122.</p> <p>16.7.2.4 Miller, Elmer T., "Forensic Glass Comparisons", <u>Forensic Science Handbook</u>, Saferstein, R., ed., Prentice-Hall, NJ, 1982, pp. 153-154.</p> <p>16.7.2.5 Thornton, J. I., "Interpretation of Physical Aspects of Glass Evidence", <u>Forensic Examination of Glass and Paint: Analysis and Interpretation</u>, Caddy, Brian, ed., Taylor & Francis, New York, NY, 2001, pp. 116-118.</p> <p>16.7.3 Questions</p> <p>The trainee will provide written answers to the following questions:</p> <ul style="list-style-type: none"> • Describe the overall examination scheme for forensic glass examination. • Why and how does broken glass transfer occur? • What are some ways broken glass can be transferred from its source to an object or clothing item? • How do fabric type and construction affect the retention of glass particles on clothing? • How does the type of material and time affect the retention of glass particles on clothing? • Why are shoes not necessarily the best evidence for glass examination? • Why does the Division of Forensic Science Trace Evidence Section combine clothing items but does not include shoes? • How should shoes be processed if an impressions examination is requested? • How should an object or tool be processed? How should it be processed if a latent prints examination is requested? • Describe how glass particles may be retained on a tool/object. <p>16.7.4 Practical Exercises</p> <p>16.7.4.1 The trainer will provide several glass samples that are large enough to allow the trainee to familiarize themselves with the manipulation of glass particles using the stereomicroscope.</p> <p>16.7.4.2 The trainer will provide a "debris" sample with a large number of glass particles in it. The trainee will search the debris and recover at least twenty particles. Ten glass particles will be mounted on a slide "as is" for refractive index determination. Another ten glass particles will be cleaned using the</p>	

16 GLASS	Page 9 of 13
<div>Division of Forensic Science</div> <div>TRACE EVIDENCE TRAINING MANUAL</div>	Amendment Designator:
	Effective Date: 29-March-2004
<p>procedure described in the Trace Evidence Glass Standard Operating Procedure and mounted on a separate slide for refractive index determination. Refractive index will be determined using the GRIM2 and the data for both slide preparations will be compared.</p> <p>16.7.4.3 The trainer will provide a “debris” sample with a known number of glass particles. The trainee will search the debris and report the number glass particles. A “known” glass sample or samples will also be provided so that the complete examination may be conducted as a practice case. Additional similar exercises will be conducted as appropriate.</p> <p>16.7.4.4 The trainer will provide the trainee with two or three exercises set up with clothing, tools or other objects that contain a known number of glass particles. The trainee will search the debris and report the number glass particles. A “known” glass sample or samples will also be provided so that the complete examination may be conducted as a practice case. Additional similar exercises will be conducted as appropriate.</p> <p>16.7.5 Evaluation</p> <p>16.7.5.1 The trainer will review the written answers to the questions with the trainee.</p> <p>16.7.5.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.</p> <p>16.7.5.3 Review of practical exercises.</p> <p>16.8 Glass Fracture Examinations</p> <p>16.8.1 Objectives</p> <p>Through completion of this module the trainee will have developed and demonstrated theoretical knowledge and/or practical skills to:</p> <ul style="list-style-type: none"> Assess the characteristics of different types of glass fractures to include those caused by impact, heat, projectiles and glass cutters; Perform point of impact and direction of impact examinations; Perform sequence of impact examinations; and, Perform fracture match examinations. <p>16.8.2 Required Readings</p> <p>16.8.2.1 Kirk, P. L., “Glass”, <u>Crime Investigation</u>, 2nd Edition, John Wiley & Sons, New York, 1974, pp. 261-267.</p> <p>16.8.2.2 Curran, J. M., et. al., “Examination of Glass”, <u>Forensic Interpretation of Glass Evidence</u>, CRC Press, Washington, D.C., 2000, pp. 6-10.</p> <p>16.8.2.3 Miller, Elmer T., “Forensic Glass Comparisons”, <u>Forensic Science Handbook</u>, Saferstein, R., ed., Prentice-Hall, NJ, 1982, pp. 146-153.</p> <p>16.8.2.4 Saferstein, R., “Physical Properties: Glass and Soil,” <u>Criminalistics: An Introduction to Forensic Science</u>, Prentice Hall, New Jersey, 5th edition, 1995, pp. 108-111.</p> <p>16.8.2.5 Thornton, J. I., “Interpretation of Physical Aspects of Glass Evidence”, <u>Forensic Examination of Glass and Paint</u>, Caddy, B., ed., Taylor & Francis, New York, NY, 2001, pp. 98-116.</p> <p>16.8.3 Questions</p>	

16 GLASS	Page 10 of 13
Division of Forensic Science TRACE EVIDENCE TRAINING MANUAL	Amendment Designator:
	Effective Date: 29-March-2004
<p>The trainee will provide written answers to the following questions:</p> <ul style="list-style-type: none"> • What is the 4R rule? • Explain how direction of impact determinations can be made. • Explain how sequence of impact determinations can be made. • Explain hackling. • Explain each of the following types of glass fracture and list the primary characteristics of each: impact fractures, heat fractures, fractures caused by projectiles, glass cutters. • Describe the process of glass fracture by impact as it relates to compression and tension forces. <p>16.8.4 Practical Exercises</p> <p>16.8.4.1 The trainee will break glass objects, such as window panes and bottles, by various methods, and examine fracture characteristics. This exercise should include glass breakage by thrown objects, by tools and by projectiles. At least one example of sequence of impact should be conducted. The trainee will write a summary of this exercise to include observations made.</p> <p>16.8.4.2 The trainee will be given at least three broken glass panes with unknown direction of force. The trainee will document observations and determine direction of force. Additional similar exercises will be conducted as appropriate.</p> <p>16.8.4.3 The trainee will be given at least three exercises involving fracture match examinations. The exercises should be designed to include both positive and negative fracture match results.</p> <p>16.8.5 Evaluation</p> <p>16.8.5.1 The trainer will review the written answers to the questions with the trainee.</p> <p>16.8.5.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.</p> <p>16.8.5.3 Review of practical exercises.</p> <p>16.9 Supervised Casework</p> <p>The trainee will work at least ten forensic cases as a technician for a qualified glass examiner. The trainer should ensure as much variety in the casework as is practicable. At least five of the glass cases must be associative reports.</p> <p>16.10 Forensic Significance of Glass</p> <p>The trainer and the trainee will discuss the interpretation of glass evidence and its relevance and weight in reports and in testimony. Discussions will include probabilities versus possibilities.</p> <p>16.10.1 Objectives</p> <p>Through completion of this module, the trainee will have developed and demonstrated theoretical knowledge and/or practical skills to:</p> <ul style="list-style-type: none"> • Knowledge of the capabilities and limitations of analytical instrumentation with reference to comparison of glass • Knowledge of other examinations used in the forensic community for glass analysis • Ability to interpret data and draw conclusions • Application of frequency of occurrence data <p>16.10.2 Required Readings</p>	

16 GLASS	Page 11 of 13
Division of Forensic Science TRACE EVIDENCE TRAINING MANUAL	Amendment Designator:
	Effective Date: 29-March-2004
<p>16.10.2.1 Curran, J. M., et. al., "Glass Found at Random and Frequency of Glass", <u>Forensic Interpretation of Glass Evidence</u>, CRC Press, Washington, D.C., 2000, pp. 87-102.</p> <p>16.10.2.2 Curran, J. M., et. al., "Transfer of Persistence Studies", <u>Forensic Interpretation of Glass Evidence</u>, CRC Press, Washington, D.C., 2000, pp. 103-131.</p> <p>16.10.2.3 Curran, J. M., et. al., "Reporting Glass Evidence", <u>Forensic Interpretation of Glass Evidence</u>, CRC Press, Washington, D.C., 2000, pp. 153-163.</p> <p>16.10.2.4 Meyer, R., et. al., "Forensic glass analysis and frequency of occurrence," <i>Midwestern Association of Forensic Scientists</i>, 1988, Vol. 17, No. 4, pp. 19-38.</p> <p>16.10.2.5 Miller, Elmer T., "Forensic Glass Comparisons", <u>Forensic Science Handbook</u>, Saferstein, R., ed., Prentice-Hall, NJ, 1982, pp. 165-168.</p> <p>16.10.3 Questions</p> <p>The trainee will provide written answers to the following questions:</p> <ul style="list-style-type: none"> • What criteria must be met for to report an association of glass evidence? • What are the limitations of the frequency of occurrence data? • How is frequency of occurrence data obtained? • What factors affect the strength of the conclusion in glass comparisons? • Describe other examinations used in the forensic community for glass analysis, with emphasis on elemental analysis. <p>16.10.4 Practical Exercises</p> <p>16.10.4.1 The trainee will draw conclusions and write a report for the examinations completed in 16.7.4.3 and 16.7.4.4.</p> <p>16.10.5 Evaluation</p> <p>16.10.5.1 The trainer will review the written answers to the questions with the trainee.</p> <p>16.10.5.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.</p> <p>16.10.5.3 Review of practical exercises.</p> <p>16.11 Report Writing</p> <p>The trainer will review and discuss with the trainee the standard report wording in Section 9.10 of the Trace Evidence Standard Operating Procedures.</p> <p>The trainer will provide ten cases previously examined by other qualified glass examiners for the trainee to review and discuss with the trainer.</p> <p>The trainee will draft report wording as a part of the analysis of their training sets as well as when performing supervised casework.</p> <p>Report writing will be evaluated throughout the training period by the trainer.</p> <p>16.12 Glass Presentation and Oral Examination</p>	

16 GLASS	Page 12 of 13
<div>Division of Forensic Science</div> <div>TRACE EVIDENCE TRAINING MANUAL</div>	Amendment Designator:
	Effective Date: 29-March-2004
<p>The trainee will prepare a presentation of approximately 20-30 minutes in length which they will present to a group consisting of qualified glass examiners, the QA Coordinator, as available, and any Director that chooses to attend. The presentation may cover either: the general theory and application of the instrumentation used in glass analysis and the forensic examination of glass or a current topic that has been approved by the Section Chief that is of interest to the forensic glass community.</p> <p>The trainee will field questions regarding their presentation topic as well as questions related to any/all aspects of their glass training.</p> <p>16.13 Competency Evaluation and Mock Trial</p> <p>16.13.1 As the trainee progresses through glass training, they will begin to process training sets as they would for casework to include drafting a Certificate of Analysis. There will be a minimum of three of these “case” files completed prior to issuance of the final competency test.</p> <p>16.13.2 Using one or all of the “cases” from 16.13.1, the trainee will undergo a series of “mini-mock trial” practice sessions with qualified examiners from the Trace Evidence Section. It may be useful to include practice sessions with examiners from Sections other than Trace Evidence.</p> <p>16.13.3 The trainee will be provided with a final competency test for analysis. This test will mimic actual casework to the maximum extent possible and will include at least two matching glass samples and one glass sample that cannot be associated with the others. Additionally, this test will include at least one positive fracture match for those trainees who have not previously completed documented fracture match training.</p> <p>The trainee will analyze the final competency test samples and issue a Certificate of Analysis based upon their findings. The trainee will be called upon to defend their results via testimony in a formal mock trial setting. The mock trial will typically be scheduled about two weeks after the glass presentation and oral examination.</p> <p>16.13.4 The trainer and the trainee will review the mock trial video tape in a timely fashion.</p> <p>16.14 Certification</p> <p>Upon successful completion of the training process, following Section 15.6 of the Division of Forensic Science, Quality Manual, the trainee will be issued a written certification memorandum.</p> <p>16.15 Reading List</p> <p>16.15.1 Caddy, Brian, ed, <u>Forensic Examination of Glass and Paint: Analysis and Interpretation</u> , Taylor & Francis, New York, NY, 2001.</p> <p>16.15.2 Curran, J., et. al., ed., <u>Forensic Interpretation of Glass Evidence</u>, CRC Press, New York, 2000.</p> <p>16.15.3 GRIM2 Installation and Instruction Manual.</p> <p>16.15.4 Kirk, P. L., <u>Crime Investigation</u>, 2nd Edition, John Wiley & Sons, New York, 1974.</p> <p>16.15.5 Manual for Locke Scientific Reference Glasses and Silicone Oils for Refractive Index Determination.</p> <p>16.15.6 McCrone, W. C., et. al., <u>Polarized Light Microscopy</u>, McCrone Research Institute, Illinois, 1984.</p> <p>16.15.7 Meyer, R., et. al., “Forensic glass analysis and frequency of occurrence,” <i>Midwestern Association of Forensic Scientists</i>, 1988, Vol. 17, No. 4.</p> <p>16.15.8 Phillips, C. J., <u>Glass: Its Industrial Applications</u>, Reinhold Publishing Corporation, New York, 1960.</p>	

16 GLASS	Page 13 of 13
Division of Forensic Science TRACE EVIDENCE TRAINING MANUAL	Amendment Designator:
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<p>16.15.9 Saferstein, R., ed., <u>Forensic Science Handbook</u>, Prentice-Hall, NJ, 1982.</p> <p>16.15.10 Saferstein, R., <u>Criminalistics: An Introduction to Forensic Science</u>, Prentice Hall, New Jersey, 5th edition, 1995.</p> <p>16.15.11 Scholes, S. R., Greene, C. H., revision ed., <u>Modern Glass Practice</u>, 7th edition, Cahners Books, Massachusetts, 1975.</p> <p>16.15.12 Tooley, F. V., ed., <u>The Handbook of Glass Manufacture</u>, Vol. I and II, Books for Industry, Inc., New York, 1974.</p> <p>16.15.13 Trace Evidence Handbook, Internal Publication.</p> <p>16.15.14 Virginia Division of Forensic Science Evidence Handling Guide.</p> <p>16.15.15 Vogel, W., <u>Chemistry of Glass</u>, Kreidl, N., ed., The American Ceramic Society, Inc., Ohio, 1985.</p> <p style="text-align: right;">◀End</p>	